

Sensor Requirements Document (SRD)

APPENDICES "B," "C," "E," "G," AND "H"

for

NATIONAL POLAR-ORBITING OPERATIONAL ENVIRONMENTAL
SATELLITE SYSTEM (NPOESS) SENSORS

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Version Two
8 March 1999

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APPENDIX A

DELETED—See Contractor's Library DEFINITION/GLOSSARY OF TERMS

APPENDIX B

SURVIVABILITY REQUIREMENTS

APPENDIX B. SURVIVABILITY REQUIREMENTS

Appendix B contains NPOESS survivability requirements and is classified. If applicable, Appendix B will be made available after contract award.

APPENDIX C
SENSOR DATA RECORD (SDR) CHARACTERISTICS (TBR)

APPENDIX D

NPOESS SYSTEM EDR REQUIREMENTS

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APPENDIX E
NPOESS EDR/RDR MATRIX

APPENDIX E NPOESS EDR/RDR MATRIX

The real-time high data rate link will contain the following mission data (*TBR*): a) High (regional) resolution visual and IR imagery (with content similar to the current DMSP fine mode and NOAA High Resolution Picture Transmission). b) Other NPOESS sensor and associated sensor data needed by the HRD field terminals to meet the EDR processing requirements specified in Table E1. c) Other (TBS) data. The real-time low data rate link will contain the following mission data (*TBR*): a) A (TBS) subset of real-time visual, visual night, and IR imagery (with content similar to the current NOAA Automatic Picture transmission or future Low Resolution Picture Transmission or DMSP's real time data smooth mode). b) Other NPOESS sensor and associated sensor data needed by the LDR field terminals to meet the EDR processing requirements specified in Table E1. c) Other (TBS) data. The processing requirements for the Centrals, HDR, and LDR processing sites are shown in 50.1 NPOESS EDR/RDR Matrix.

50.1 NPOESS EDR/RDR Matrix. R = RDRs and E = EDRs

PARAMETER	DoD (NAVY)			DOC			DoD (AF/ARMY)			
	FNMOC	HDR Field	LDR Field	NESDIS	HDR Field	LDR Field	AFGWC	50 WS	HDR Field	LDR Field
KEY ENVIRONMENTAL PARAMETERS										
Atmospheric Vertical Moisture Profile	R/E	R/E		R	R	R	R/E		R/E	R/E
Atmospheric Vertical Temperature Profile	R/E	R/E		R	R	R	R/E		R/E	R/E
Imagery	R/E	R/E	R/E	R	R	R	R/E		R/E	R/E
Sea Surface Temperature	R/E	R/E		R	R	R	R/E		R/E	R/E
Sea Surface Winds	R/E	R/E	R/E	R	R	R	R/E		R/E	R/E
Soil Moisture	R/E	R/E		R	R	R	R/E		R/E	R/E
ATMOSPHERIC PARAMETERS										
Aerosol Optical Thickness	R/E	R/E	R/E	R			R/E		R/E	R/E
Aerosol Particle Size	R/E	R/E	R/E	R			R/E		R/E	R/E
Ozone Total Column/Profile				R						
Precipitable Water	R/E	R/E		R	R	R	R/E		R/E	R/E
Precipitation Type/Rate	R/E	R/E	R/E	R	R	R	R/E		R/E	R/E
Pressure (surface/profile)	R/E	R/E	R/E	R			R/E		R/E	R/E
Suspended Matter	R/E	R/E	R/E	R			R/E		R/E	R/E
Total Water Content	R/E	R/E		R			R/E		R/E	R/E
CLOUD PARAMETERS										
Cloud Base Height	R/E	R/E	R/E	R	R	R	R/E		R/E	R/E
Cloud Cover/Layers	R/E	R/E	R/E	R	R	R	R/E		R/E	R/E
Cloud Effective Particle Size	R/E	R/E		R	R	R	R/E		R/E	R/E
Cloud Ice Water Path				R	R	R	R/E		R/E	R/E
Cloud Liquid Water	R/E	R/E		R	R	R	R/E		R/E	R/E
Cloud Optical Depth/Transmittance	R/E	R/E		R	R	R	R/E		R/E	R/E
Cloud Top Height	R/E	R/E	R/E	R	R	R	R/E		R/E	R/E
Cloud Top Pressure				R	R	R	R/E		R/E	R/E
Cloud Top Temperature	R/E	R/E	R/E	R	R	R	R/E		R/E	R/E
EARTH RADIATION BUDGET PARAMETERS										
Albedo (Surface)	R/E	R/E	R/E	R			R/E			
Downward Longwave Radiation (Surface)	R/E	R/E		R						
Insolation	R/E	R/E		R						
Net Shortwave Radiation (TOA)	R/E			R						
Solar Irradiance	R/E			R						
Total Longwave Radiation (TOA)	R/E			R						
LAND PARAMETERS										
Land Surface Temperature	R/E	R/E		R	R	R	R/E		R/E	R/E
Normalized Differential Vegetation Index (NDVI)				R	R	R				
Snow Cover/Depth	R/E	R/E	R/E	R	R	R	R/E		R/E	R/E
Vegetation/Surface Type	R/E	R/E	R/E	R	R	R	R/E		R/E	R/E

PARAMETER	DoD (NAVY)			DOC			DoD (AF/ARMY)			
	FNMOC	HDR Field	LDR Field	NESDIS	HDR Field	LDR Field	AFGWC	50 WS	HDRD Field	LDR Field
OCEAN/WATER PARAMETERS										
Currents	R/E	R/E	R/E	R						
Fresh Water Ice	R/E	R/E		R	R	R	R/E		R/E	R/E
Fresh Water Ice Motion	R/E	R/E		R	R	R				
Ice Surface Temperature	R/E	R/E		R	R	R	R/E			
Littoral Sediment Transport	R/E	R/E		R						
Net Heat Flux	R/E	R/E		R						
Ocean Color/Chlorophyll	R/E	R/E		R	R	R				
Ocean Wave Characteristics	R/E	R/E		R	R	R				
Sea Ice Age and Sea Ice Motion	R/E	R/E	R/E	R	R	R				
Sea Surface Height/Topography	R/E	R/E	R/E	R	R	R	R/E			
Surface Wind Stress	R/E	R/E		R	R	R				
Turbidity	R/E	R/E	R/E	R						
SPACE ENVIRONMENTAL PARAMETERS										
Auroral Boundary				R					R/E	
Auroral Energy Deposition (Total)				R					R/E	
Auroral Imagery				R					R/E	
Electric Field				R					R/E	
Electron Density Profile/Ionospheric specification				R					R/E	
Geomagnetic Field				R					R/E	
In-Situ Ion Drift Velocity				R					R/E	
In-Situ Plasma Density				R					R/E	
In-Situ Plasma Fluctuations				R					R/E	
In-Situ Plasma Temperature				R					R/E	
Ionospheric Scintillation				R					R/E	
Neutral Density Profiles/Neutral Atmospheric Spec				R					R/E	
Radiation Belt and Low Energy Solar Particles	R/E			R					R/E	
Solar and Galactic Cosmic Ray Particles	R/E			R					R/E	
Solar EUV Flux				R					R/E	
Supra Thermal through Auroral Energy Particles				R					R/E	
Upper Atmospheric Airglow				R					R/E	
OTHER PARAMETERS										
Surface Data Collection				stored	real-time (TBR)					
Search and Rescue										
Data to be available at the 13 S&R Mission Control Centers and 25 S&R Local User Terminals (LUTs)										

APPENDIX F

DELETED—See Contractor's Library ACRONYMS AND ABBREVIATIONS

APPENDIX G

POTENTIAL PRE-PLANNED PRODUCT IMPROVEMENTS

APPENDIX G POTENTIAL PRE-PLANNED PRODUCT IMPROVEMENTS

70.1 Potential Pre-planned Product Improvements. This paragraph describes elements of the NPOESS mission needs having potentially restrictive technical or programmatic uncertainties identified as a result of Phase 0 Concept studies. DOC and DoD maintain a need for these observations, and prioritize them in terms of mission criticality below. The NPOESS Demonstration/Validation (Phase 1) allows for continued examination of possible solutions to these needs, including new or modified instrumentation in future space segments beyond NPOESS IOC. Candidate technologies for meeting these needs should be examined in NPOESS Phase 1 for possible inclusion at a later time. No thresholds are stated.

70.1.1 Tropospheric Winds (DOC/DoD). Wind measured throughout the troposphere. Wind profile required for cloud returns and planetary boundary layer aerosol returns.

	<u>Thresholds</u>	<u>Objectives</u>
a. Vertical Coverage	N/A	Surface to 20 km
b. Horizontal Cell Size	N/A	50 km
c. Vertical Sampling Interval	N/A	0.1 km
d. Mapping Uncertainty	N/A	10 km
e. Measurement Range	N/A	0-100 m/s
f. Measurement Precision	N/A	0.5 m/s, vector winds
g. Measurement Accuracy	N/A	1 m/s, horiz. components
h. Maximum Local Average Revisit Time	N/A	1 hour

70.1.2 Ozone Profile - High-Resolution (DOC). Measurement of ozone concentration within a specified volume.

	<u>Thresholds</u>	<u>Objectives</u>
a. Vertical Coverage	N/A	(TBD)
b. Horizontal Cell Size (Profile)	N/A	250 km
c. Vertical Cell Size (Profile)		
1. 0-10 km	N/A	3 km
2. 10-25 km	N/A	1 km
3. 25-60 km	N/A	3 km
d. Mapping Uncertainty (Profile)	N/A	25 km
e. Measurement Range (Profile)		
1. 0-10 km	N/A	0.01-3 ppmv
2. 10-60 km	N/A	0.1-15 ppmv
f. Measurement Precision (Profile)		
1. 0-10 km	N/A	10 %
2. 10-15 km	N/A	3 %
3. 15-50 km	N/A	1 %
4. 50-60 km	N/A	3 %
g. Measurement Accuracy (Profile)		
1. 0-10 km: N/A	N/A	10 %
2. 10-15 km: 20 %	N/A	10 %
3. 15-60 km: 10 %	N/A	5 %
h. Maximum Local Average Revisit Time (Profile)	N/A	24 hours
i. Long Term Stability (Profile)	N/A	1 %

70.1.3 CH₄ (Methane) Column (DOC). Measure of amount of methane contained in a specified volume of air.

	<u>Thresholds</u>	<u>Objectives</u>
a. Vertical Coverage	N/A	Total column
b. Horizontal Cell Size	N/A	100 km
c. Mapping Uncertainty	N/A	25 km
d. Measurement Range	N/A	40-80 moles/cm ²
e. Measurement Precision	N/A	1 %
f. Measurement Accuracy	N/A	5 %
g. Maximum Local Average Revisit Time	N/A	24 hours

70.1.4 CO (Carbon Monoxide) Column (DOC). Measure of carbon monoxide in a specified volume of air.

	<u>Thresholds</u>	<u>Objectives</u>
a. Vertical Coverage	N/A	Total column
b. Horizontal Cell Size	N/A	100 km
c. Mapping Uncertainty	N/A	25 km
d. Measurement Range	N/A	0 - 7 moles/cm ²
e. Measurement Precision	N/A	3 %
f. Measurement Accuracy	N/A	5 %
g. Maximum Local Average Revisit Time	N/A	24 hours

70.1.5 CO₂ (Carbon Dioxide) Column (DOC). Retrievals of column and total carbon dioxide, calibrated by the users with ground-based measurements, of stated precision needed to afford deduction of long-term variations and trends.

	<u>Thresholds</u>	<u>Objectives</u>
a. Vertical Coverage	N/A	Total column
b. Horizontal Cell Size	N/A	100 km
c. Mapping Uncertainty	N/A	25 km
d. Measurement Range	N/A	11,000 - 15,000 moles/cm ²
e. Measurement Precision	N/A	15-20 moles/cm ²
f. Measurement Accuracy	N/A	(TBD)
g. Maximum Local Average Revisit Time	N/A	24 hours

70.1.6 Optical Backgrounds (DoD). Emissions are the result of interactions between precipitating energetic particles and solar ultraviolet radiation with neutral atmospheric constituents.

	<u>Thresholds</u>	<u>Objectives</u>
a. Coverage	N/A	Global
b. Horizontal Cell Size	N/A	10 km
c. Mapping Uncertainty	N/A	50 km
d. Measurement Range		
1. Wavelength	N/A N/A	1-29 microns, 0.4-0.7 microns, 0.04-0.2 microns
2. Brightness	N/A	(TBD)
e. Measurement Precision	N/A	(TBD)
f. Measurement Accuracy	N/A	(TBD)
g. Maximum Local Average Revisit Time	N/A	each orbit

70.1.7 Bathymetry (Deep Ocean and Near Shore) (DoD). Vertical depth of water.

	<u>Thresholds</u>	<u>Objectives</u>
a. Vertical Coverage		
1. Deep Ocean	N/A	0-300 m
2. Near shore	N/A	0-200 m
b. Horizontal Cell Size		
1. Deep Ocean	N/A	300 m
2. Near shore	N/A	(TBD)
c. Vertical Cell Size	N/A	1 m
d. Mapping Uncertainty	N/A	10 m
e. Measurement Range		
1. Deep Ocean	N/A	0-300 m
2. Near shore	N/A	0-200 m
f. Measurement Accuracy	N/A	0.3 m
g. Maximum Local Average Revisit Time	N/A	(TBD)

70.1.8 Bioluminescence (DoD). A measurement of the number of bioluminescent organisms present in sea water within a region.

	<u>Thresholds</u>	<u>Objectives</u>
a. Horizontal Cell Size	N/A	(TBD)
b. Mapping Uncertainty	N/A	(TBD)
c. Measurement Accuracy	N/A	(TBD)
d. Maximum Local Average Revisit Time	N/A	(TBD)

70.1.9 Salinity (DoD/DoC). A measure of the quantity of dissolved materials in sea water. A formal definition is “the total amount of solid materials, in grams, contained in one kilogram of sea water, when all the carbonate has been converted to oxide, the bromine and iodine converted to chlorine, and all organic matter is completely oxidized. Units of measurement are parts per thousand, by weight.”

	<u>Thresholds</u>	<u>Objectives</u>
a. Vertical Coverage	N/A	0-300 m
b. Horizontal Cell Size		
1. Global	N/A	20 km
2. Regional	N/A	0.25 km
c. Vertical Cell Size		
1. Global	N/A	10 m
2. Regional	N/A	2 m
d. Mapping Uncertainty		
1. Global	N/A	5 km
2. Regional	N/A	0.25 km
e. Measurement Range	N/A	0-40 ppt
f. Measurement Precision	N/A	0.1 ppt
g. Measurement Accuracy		
1. Global	N/A	(TBD)
2. Regional	N/A	0.5 ppt
h. Maximum Local Average Revisit Time	N/A	72 hours

APPENDIX H
TEST VERIFICATION MATRIX
(TBD)